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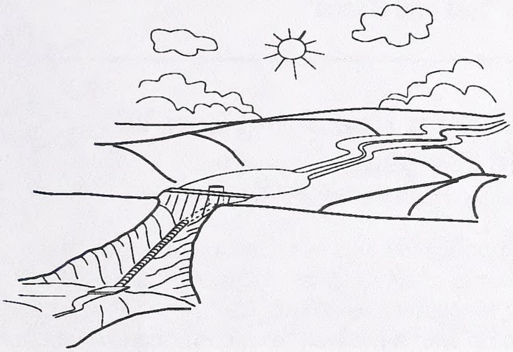
THE ENGINEERING IN AGRICULTURE NEWSLETTER

Erosion Control Drop Structure

Bill MacMillan, Regional Engineer, Fairview

In October of 1990 an erosion control structure was installed on the Marvin Brucks property in the Peoria area of ID# 19 Birch Hills. The structure protects cropland from a large gully cutting into the field from banks of the Kakut Creek. Water is conveyed over a 120 metres of drop on a 20% slope using a pipe drop structure. The pipe structure will handle a 1:25 year design storm. Flows above that level are diverted away from the structure by a grassed spillway. Engineering design and construction supervision was provided by Alberta Agriculture, Food and Rural Development.



One of the significant features of this project was the use of small equipment and standard materials. The contractor used a Bobcat loader and backhoe and a D3 CAT. The structure is composed of a standard prefab concrete catch basin and a 400 mm steel culvert.

These innovations reduced the cost of the structure to just over $100 per metre. This is well within reach of the average large farm operation in Alberta.

Spring 1993

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Farm Decision-Making

Murray Green, Farm Machinery Engineer, Airdrie

Engineers, agronomists, and economists are combining efforts to make the process of decision-making easier. Today, there is so much information and so many decisions to be made, that it is almost an insurmountable task to make all the best decisions. Farm processes are rapidly changing to ensure the preservation of agricultural resources, and to also ensure that financial objectives are met.

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Alberta
AGRICULTURE, FOOD AND
RURAL DEVELOPMENT
Engineering Services

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The purpose of this newsletter is to advise of activities and projects being conducted by Alberta Agriculture, Food and Rural Development's Engineering Services and Regional Agricultural Engineering staff. For further information on these projects and other engineering related activities contact:

Lethbridge	381-5112	Airdrie	948-8537
Red Deer	340-5322	Vermilion	853-8224
Barrhead	674-8253	Fairview	835-2291
Edmonton (Eng. Services)	427-2181	Lethbridge (AFMRC)	329-1212

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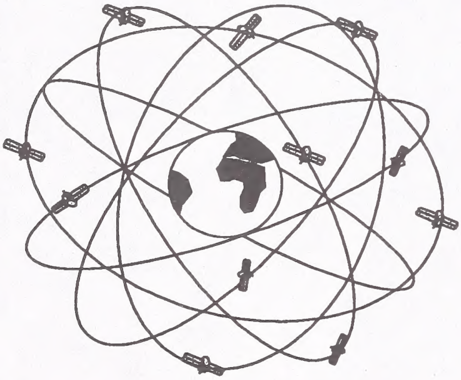
The federal government's Prairie Agricultural Research Initiative (PARI) is funding the development of a computer program to assist farmers to gather information and data, and to process it with their own farm information and specifications. The computer program is to be a farmer used tool, applied first to soil and water management concerns. Ultimately, the program will allow the user to include all aspects of farming. Although the PARI project runs for four years, the developers hope to have some models running in two.

GPS (Global Postitioning System)

Marshall Eliason, Farm Machinery Engineer, Edmonton



Alberta Agriculture, Food and Rural Development and the Universities of Alberta and Calgary are combining forces to develop and evaluate a precision farming system. The project, funded under the Canada/Alberta Environmentally Sustainable Agriculture (CAESA) agreement, will look at developing an operational system for mapping, monitoring and managing crop production information on a local field basis. The basis of the project is to use the Global Positioning System (GPS) to correlate crop producton information to specific field locations. GPS is a satellite based locating system which provides postition locating information. The project will use GPS signals along with soil, fertilizer, terrain and crop information to develop better farm resource management techniques. Better utilization of agricultural resources will maximize profits while promoting sustainable and environmentally responsible management practices. The four year project is slated to begin testing this fall at various locations throughout the province.

Dusty Barns

Brian Kennedy, Regional Engineer, Vermilion

There are many contaminants in the barn environment. Dusts and gases are produced by the breakdown of manure and the action of the animals.

Herdspersons working in a barn can suffer health related problems due to exposure to dusts in the barn. Symptoms of coughing, wheezing, allergies and chronic bronchitis can occur over time.

Dust in the barn environment is made up of faecal particles, skin and feather particles, fungi, insects and insect parts, bacteria and other miscellaneous particles. Particles larger than 10 microns settle out of the air rapidly. The smaller particles (less than 5 microns) are classified as respirable. Of these the larger sizes are trapped in the upper respiratory tract, while the smaller ones penetrate deep into the lungs.

Workers in a livestock barn can protect themselves by using disposable dust masks, chemical cartridge respirators or powered air-purifying respirators. More information on dusts in the livestock barn is available in Canada Plan Services Plan M9707 - "Protecting Workers in Livestock Buildings From Dust and Gases".

Sensor for Measuring Low Volume Fluid Deposit

Robert Maze, Project Engineer, AFMRC, Lethbridge

Using principles similar to micro computer circuit board manufacturing, engineers at the Alberta Farm Machinery Research Centre (AFMRC) have come up with a method for measuring low volume fluid deposits. The system has a number of applications including measurement of spray drift, chemical deposits in crop canopies and other low volume fluid applications.

Prior to the systems development, methods for measuring low fluid volumes were either time consuming or costly (e.g. laser particle sizing or spectrophotometry). Tests indicated that fast, accurate, and inexpensive measurements of spray volume could be taken with the AFMRC system.

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The production costs of each sensor is $3.50.

At present, the smallest volume which can be measured by the system is 0.0005 microlitres, representing the volume in a droplet with a 50 micron diameter. However, the size and speed of the sensing region is adjustable to the volume of application and measurement area of interest.

The Wind and the Odour

Rich Smith, Regional Engineer, Airdrie (Carbon Project)
Wayne Winchell, Regional Engineer, Barrhead (Leduc Project)

Liquid swine manure is a valuable source of crop nutrients and organic matter, but the odours created during storage and spreading of the manure can be a serious nuisance. Engineering staff have been working with producers to find solutions to these problems. In 1992, two odour control projects were initiated. An On-Farm Demonstration Project near Carbon tested two strategies for reducing odour nuisance. The first phase was erection of a ten-foot high windbreak fence around the manure storage lagoon. The second technique was injection of the manure several inches below the soil surface during land application.

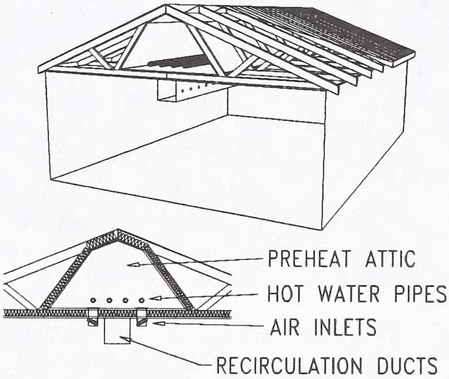
The wind screen seemed to reduce the intensity of the odours from the lagoon, but the smell was still carried down wind to the neighbours. These screens probably have more potential as a public relations gesture than as a real nuisance reduction measure. Under favourable soil conditions, the injection process was very successful in reducing odours. Since this procedure also improves nutrient use, injection of manure will most likely become a common practice.

An applied research project southeast of Leduc is studying the effects of wind-break fencing and a plastic cover on the manure lagoon of a 70 sow, farrow-to-finish hog operation. In the summer of 1992, an 8' high slab fence was constructed around the lagoon. Odour frequency and odour intensity were monitored subjectively by the producer and by the neighbour who lives 230 meters downwind of the operation. Ambient weather data was collected for the purpose of establishing weather patterns relating to odour nuisance. In the spring of 1993, a plastic tarp cover was suspended over the lagoon, inside the windbreak fence, and odour will again be subjectively monitored.

Successful Dairy Calf Barn Ventilation

Robert Borg, Regional Engineer, Red Deer

Surveys have shown that up to 40% of calves on dairy farms have been treated for pneumonia - a suspected factor is poor ventilation systems. The barn shown in the diagram was built on a Camrose dairy farm. It has gone through the last two winters with zero cases of scours or pneumonia!



The secrets to the ventilation system are:

- A preheat attic created with special order trusses allow the cool winter air to be heated before it enters the calf room. Hot water pipes are located in the attic. An outdoor reset thermostat increases the water temperature when the outdoor temperature falls. This eliminates seasonal temperature variations.

- The controller maintains a minimum ventilation

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rate in the winter. In the summer the controller increases the exhaust fan speed and proportionally opens the air inlets with an electric actuator.

- The air recirculation duct maintains a constant air circulation without creating drafts at calf level.

Wild Rice Processing in Alberta

John Kienholz, Mechanical Engineering Technologist, Edmonton

The processing of wild rice has been difficult to control. This has resulted in lost quality and markets. Alberta Agriculture, Food and Rural Development, in cooperation with the Alberta Wild Rice Growers Association, has developed a much improved process. Financial assistance was provided through the "Northern Alberta Agreement".

An in-depth review of current technology revealed that the process was poorly defined. With assistance from Dr. Hadyizev at the University of Alberta, a three-phase process was developed as a basis for precise control over parching. A parcher was then designed to meet the control requirements. Initial tests proved that the unit could easily provide the control necessary for a consistent high quality wild rice product. It was also discovered that the unit could accommodate process variations useful for a variety of products. The industry is very pleased with the development.

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Computerized Mapping Planning Tool

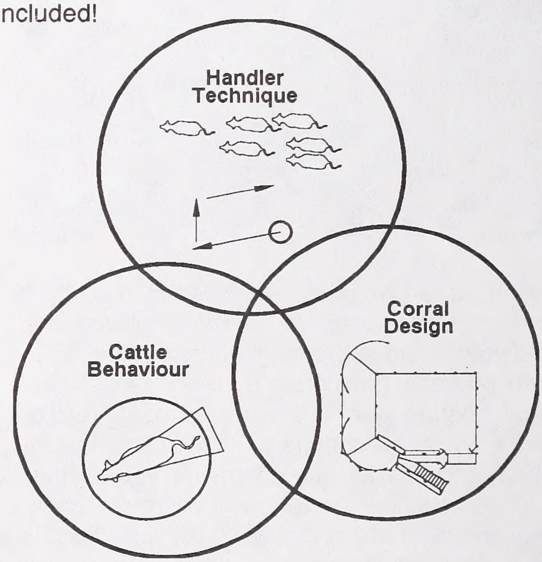
Dave Scott, Systems Engineer, Edmonton

In recent years the province has provided several financial assistance programs to farmers to address rural water shortage problems. These programs have been administered by the Engineering Services Branch. As a result, a large amount of computerized information on dugouts, wells, pipelines and water pumping data has been collected. With the assistance of the Irrigation Branch, water pumping data is presently being superimposed onto a provincial map and onto the county maps of Thorhild and Athabasca. Future goals are to map other resource information and to include other counties. These maps will be used as a tool in working with counties and municipalities to clearly identify problem areas and solutions to rural water supply problems.

Corrals For Handling Beef Cattle

Robert Borg, Regional Engineer, Red Deer

A new manual on cattle handling facilities will soon be available from Alberta Agriculture, Food and Rural Development. Some features are sections on cattle behaviour, handling techniques, and corral design. Twenty layouts, along with a cost index for each, corral geometry details, and hints on how to build gates, fences, and chutes are included!



The Cattle Handling Equation